

RECEIVED SIGNAL QUALITY MEASUREMENT TRIGGERING AND REPORTING

TECHNICAL FIELD

[0001] The present invention relates generally to an apparatus and method for received signal quality measurement management, and particularly to an apparatus, method and computer program product for use in terminal and/or network devices for wireless communication such as according to LTE, LTE-A, triple carrier WCDMA and the like.

BACKGROUND

[0002] Prior art which is related to this technical field can e.g. be found in specifications 3GPP TR36.819 (current version 11.1.0) and 3GPP TS36.331 (current version 10.5.0).

[0003] The following meanings for the abbreviations used in this specification apply:

[0004] 3GPP: 3rd Generation Partnership Project

[0005] CoMP: Coordinated Multipoint

[0006] CRS: Common Reference Signal

[0007] CSI: Channel State Information

[0008] eNB: Evolved Node B

[0009] LTE: Long Term Evolution

[0010] LTE-A: LTE-Advanced

[0011] RE: Resource Element

[0012] Rel.: Release

[0013] RRC: Radio Resource Control

[0014] RRH: Remote Radio Head

[0015] RS: Reference Signal

[0016] RSRP: Reference Signal Received Power

[0017] RSRQ: Reference Signal Received Quality

[0018] TP: Transmission Point

[0019] UE: User Equipment

[0020] WCDMA: Wideband Code Division Multiple Access

[0021] In LTE Rel.11 CoMP WI, intra- and inter cell CSI-RS based CSI measurement is supported. CSI-RS resource is defined as a set of CSI-RS REs configured by high layer signalling. UE can be configured with multiple CSI-RS resources (as CoMP measurement set). Each can be corresponding to one TP or one cell depending eNB's configuration.

[0022] FIGS. 3 to 6 show four scenarios considered with specification 3GPP TR36.819. FIG. 3 shows scenario 1 depicting a homogeneous network with intra-site CoMP. FIG. 4 shows scenario 2 depicting a homogeneous network with high Tx power RRHs. FIG. 5 shows a reference CoMP coordination cell layout for scenario 2. FIG. 6 illustrates scenarios 3 and 4, wherein scenario 3 is a heterogeneous network with low power RRHs within the macrocell coverage where the transmission/reception points created by the RRHs have different cell IDs as the macro cell, and scenario 4 is a heterogeneous network with low power RRHs within the macrocell coverage where the transmission/reception points created by the RRHs have the same cell IDs as the macro cell.

[0023] In the CoMP discussion of LTE Rel. 11, the scenario 4 (see FIG. 6) has been given a lot of attention, where one cell is managing multiple number of geometrically separated Tx/Rx points. As a consequence, the intra-cell CSI measurement and feedback is needed for the eNB to choose the TPs for CoMP operation. CoMP scenario 1/2/3 (see FIGS. 3 to 6) assumes each TP has its own cell id thus inter cell CSI feed-

back is needed. Although there it could be relied on traditional CRS based received signal quality measurement report to manage inter-cell part, a unified solution for both inter and intra cell scenario is still preferable from standardization perspective. The reason is that from UE point of view, the UE is not aware if the TPs are from a same cell or not. Furthermore, such unified structure can eliminate the cell boarder issue, since when UE moves from one cell to another, CSI-RS based measurement set management can work continuously. **[0024]** Recently, the CSI-RS based received signal quality measurement and report is agreed to provide the eNB enough information to manage the CoMP measurement set (by configuring multiple CSI-RS resources to this UE). Thus, there is a need for a detailed triggering and reporting procedure for CSI-RS based measurement.

[0025] In LTE Rel. 8-10, CRS based RSRP/RSRQ measurement was defined with different event triggers, e.g. when serving cell becomes better/worse than threshold, when neighbouring cell becomes better than threshold, when neighbouring cell becomes offset better than serving cell etc.

[0026] Those events might not be suitable for CSI-RS based measurement for CoMP set management, due to the following issues. The CoMP measurement set management is not designed for handover purpose. It rather intends to select several cells with similar received signal quality instead of only selecting the strongest one. Further, the CoMP measurement set includes multiple cells/TPs (here, the term TP is used in a sense as a generic term for geometrically separate signal transmitter which may have the same or different cell id in different scenarios), which means multiple serving cells/TPs for event triggering. Finally, there is no definition of "serving" or "neighbouring" to which current events could refer to in terms of transmission points.

[0027] As a solution, one of the TP in the measurement set could be defined as serving TP, and then existing events defined for CRS based RSRP could be applied. However, CoMP UE is normally located at the TP edge. That is to say the arrival signal strength from two TPs are similar for which reason these two TPs should be both in the measurement set. However, the RSRP of serving TP can easily be lower than that of another TP, which means frequent triggering the serving TP switching which is totally unnecessary.

SUMMARY OF THE INVENTION

[0028] It is an object of the present invention to provide an apparatus and method for received signal quality measurement management triggering and reporting.

[0029] According to a first aspect of the present invention, according to certain embodiments thereof, this is accomplished by an apparatus, comprising a threshold determination processor configured to define a received signal quality range including a best received signal quality as upper border, which is the best received signal quality among all received signal qualities measured in a received signal quality measurement procedure; and a reporting processor configured to process a report including a predetermined number of signal originating points providing a received signal quality at a reference location within the received signal quality range defined by the threshold determination processor.

[0030] The first aspect of the invention includes that the apparatus can be arranged for use in a wireless communication device.

[0031] The predetermined number of signal originating points may be an integer number N and may comprise the N